…R IN GARDENING AND FARMING.

Marriage of Research and Industry—What the Experiment Stations are Doing.

Gardening is an evolutionary art, as everybody knows who knows the rose and the chrysanthemum as they were fifty years ago, and looks at them as they are to-day. As with flowers, so with fruits and the tenantry of the kitchen garden. Contrast a Baldwin apple with the ancestral crab, or a parsnip with the tough little root from which it is descended. Once each individual grain on an ear of corn was wrapped in a sheath by itself; good breeding has here as effectually done its work as in the case of building the Hereford ox for beef and the Jersey cow for milk. In enriching the soil, in careful tillage, in selecting seeds from the thriftiest plants, in crossing varieties, in seizing upon the "sports" nature offers the gardener has been able to work wonders.

Ample proof of this is gathered in the southwest corner of the Agricultural building at the World's Fair, where the experiment stations make their exhibit. Here are contrasted, not only vegetables and fruits with the unpromising stock from which they came, but an elaborate display of how the chemist and the inventor have gone into partnership with both the gardener and the farmer. As we enter we see a row of glass jars filled with water, each sustaining a corn, pea, or flax plant, fed by appropriate chemicals in solution, verifying the chemist's dictum that every specific crop demands from the soil a particular kind and quantity of diet. Near by is another row of jars filled with sand instead of water, each jar also suitably fed; in this row the plants have firm support, and look the better for it. The chemical analysis of soils is not to-day considered as important as it formerly was, yet at times it has very great value, as where in New Jersey certain of the peach growers have doubled their crops by acting on the advice of the chemist at the New Brunswick station and giving their soil the potash it lacked. Before the days of chemical tests the dealers in fertilizers had it all their own way; the firms that made the boldest claims did the biggest business. Eighteen years ago, in Connecticut, farmers were paying all the way from 10¼ cents to $1.67 per pound for their nitrogen, and from 10¼ to 25½ cents per pound for their soluble phosphoric acid; today they buy their fertilizers on analysis, and no imaginary element enters into the price. As the people of Connecticut expend annually, chiefly for their tobacco crops, some $500,000 for fertilizers, in the single item of economizing this outlay the experiment station at Middletown has saved the State much more than its cost.

While the chemical test tube and the scales have served to show the farmer the worth of the phosphates and nitrates offered him, a simple bit of home-made apparatus enables him to test the vitality of seeds—often sold at high prices. Mr. H. L. Bolley, the chemist of the North Dakota station at Fargo, has devised a seed tester that can be put together in two minutes. A small tin pan is turned upside down inside a large one. On the bottom of the small pan a piece of folded cotton is spread under and over the seed to be tested; the cloth hangs down into a little water poured into the large pan, so as to keep the seed thoroughly moist. The special application of this tester in the Northwest has been to ascertain the value of frosted wheat for seed. In the Dakotas and Minnesota the farmer often suffers from an early frost so severe that he must either plant nipped grain or buy his seed. Fortunately, he finds that, as a rule, he can use frosted grain with safety. At the Fargo station, Mr. Bolley says, no fewer than 146 varieties of wheat are grown with intent to compare their hardiness, yield, and resistance to disease; several of these varieties are the result of artificial crossing. The keeping seed wheat true to a single variety is a point which has long been held as important by observing farmers; indeed, it is a point forced upon them by their harvesting machinery. If they plant different varieties of wheat together, they cannot avoid cutting in the same swath grain ripe and unripe. Mr. Pillsbury, the famous miller of Minneapolis, through the Minnesota experiment station, has distributed hundreds of sacks of pure seed, and proved how much a harvest is improved in quality and increased in quantity by taking pains in this matter.

STOCK-FEEDING EXPERIMENTS.

Between wheat as it grows in Minnesota and as it grows in Southern Illinois or Kansas, there is very decided difference. The berry in its southward migration loses hardness and milling quality. So with other cereals. A hog fed on rations of corn in Canada lays on more flesh and less fat than his cousin in Kansas; or to express it as the chemists do, corn in Canada is richer in protein and poorer in carbo-hydrates than in Kansas. A question, therefore, for the experiment stations in the Middle States is: can we breed a variety of corn with the good points of the Canadian article? Why the hog is so popular a medium for sending crops to market comes out when we glance at three tall glass boxes standing beside each other in the stock-feeding exhibit. Each box contains corn, peas, and oats in the proportions best suited for building pork, mutton, and beef. To add ten pounds to his weight the hog asks but half as much provender as the sheep, and only about a third as much as the ox. So much for personal inactivity as an element in turning the scale of advantage; in feeding for fat the farmer gives his hogs corn, in feeding for flesh he adds skim milk or other nitrogenous food. Near the cross sections of porkers which make all this plain and clear are tall glass jars, showing how valuable a flesh-former is the cake made from cotton seed after the oil is pressed out of it. It is but a few years since cotton seed, with all its wealth of oil, was thrown away or, crudely fermented was used in part for hog feed. Not until machinery had been invented to free the seed from lint, express its oil, and thoroughly pulverize the residue, did cotton seed rise to its present value.

Close to the exhibit of cotton-seed products the botanists of the experiment stations show an alcove of forage plants. To inexperienced eyes the alfalfa of Colorado and California, despite its being a perennial of the hardiest, bears a somewhat seared and woody look. From Japan comes the soya bean, now successfully cultivated; it is highly prolific. Here, too, in percentages, we are told how much is gained in nutrition by waiting until hay is thoroughly ripe before cutting it. In a large wire frame is exposed the root system of a corn plant; the roots have spread themselves so thoroughly through the earth, and come so near to its surface, that the injury which close and deep ploughing can do is clearly accounted for. In an adjoining case is a model of a well-built silo; this attracts a good deal of attention. When silos were first introduced in this country they were usually filled with green crops; to-day it is found better to fill them with crops well matured, except in Kansas and other States where summer heats rise above the average.

Cereals, as a rule, are best cultivated in their native latitudes; not so with fruits. The common wild plum taken to North Dakota develops into a luscious fruit. In Michigan, where much attention is paid to apple culture, although native varieties are held in favor, certain Russian apples have richly repaid experiment. Very often the giving a tree a new home has done it good, in freeing it from parasites such as the curculio and the black-knot fungus, which have in some districts of New England almost extirpated the plum. Very few parasites, however, are to be escaped by this easy path of emigration, and the war upon them is one of the most curious and gainful branches of experiment.

IT PAYS TO KNOW ABOUT INSECTS.

The students of insects who for generations have been gathering moths, bugs, and beetles, have without knowing it laid the foundation for a science and art that to-day adds many millions a year to the value of the world's harvests. Studying the form of a fly, its transformations, its mode of breeding, its migrations, its food, and its enemies, may seem a mere pastime, but as a matter of fact it can be of great practical importance. Very possibly the old Greek geometers had a good many neighbors who thought the studies of the properties of ellipses and triangles the sheerest waste of time, but in that waste of time lay the groundwork of astronomy and the practical arts of the engineer and navigator. As we look at them in their long row of cases, most formidable are the grubs, flies, and beetles which enforce upon man their partnership in the fruits of the earth which he has improved and cultivated with so much pains. Here is display after display of the highly developed ingenuity by which they maintain their foothold or widely extend their range of destruction. Take the case of the apple maggot, which thrives in Maine to the dismay of the orchardist, and you have a typical example of the difficulties of a fight with an insect, and of the value of careful observation before declaring war. In studying the maggot's life history Mr. F. L. Harvey, at the Orono experiment station, found that windfalls particularly abound with the pest, and that soon after an apple falls to the ground the maggot goes into the earth there in due season to send forth a new brood of devastators. The moral of this to the apple growers of Maine is plain enough; gather your windfalls promptly, and if you cannot feed them to hogs destroy them. In a series of admirable colored drawings Mr. Harvey presents the whole cycle of the maggot's activity and clearly brings out the weakest point for attack.

For the best example of the usefulness of this kind of research to fruit growing industry we must adjourn for a moment to the cases of the Department of Agriculture in the Government building, and there see the fluted scale insect which five years ago threatened the orange groves of California with extinction. When in their extremity the orange growers sought at Washington the advice of Mr. C. V. Riley, entomologist to the department, he asked: "Where did the pest come from?" "Australia," was the answer. "Is it much of a nuisance there?" "Not particularly." "Then what keeps it down; what preys upon it?" "Nothing specially," was the response. Dissatisfied with this reply, Mr. Riley sent to Australia a trained entomologist in the person of Mr. Albert Koebele, who gathered various species of insects that were seen to prey upon the fluted scale. Distributing those on his arrival in California he was fortunate enough to find that one of his assisted emigrants, a lady bird, known in the books as *Vedalia cardinalis*, fed so ravenously on the fluted scale as to extirpate it. Its orange groves saved, California enlisted Mr. Koebele to do battle with other of its insect plagues, convinced that a thoroughly informed student and observer is the most valuable ally the farmer and fruit grower can engage.

FIGHTING INJURIOUS FUNGI.

To return to the show of the experiment stations: Beside arraying one insect against another, the fight against vermin in the field and garden is largely a matter of chemistry. Here are scores of preparations of arsenic, corrosive sublimate, and equally deadly poisons to be applied with bellows, or pumps and spraying machines. With valuable trees an inclosing tent can be readily set up for the generation in a simple apparatus of hydrochloric gas, speedily fatal to insects. But insects are not the only pests of the farm and orchard. Some of the most baneful are, like certain patent medicines, purely vegetable. Rusts, for example, are fungi well nigh omnivorous. In their manifold kinds they attack crops as diverse as wheat, oats, barley, cotton, apples, beets, celery, clover, oranges, plums, pears, peaches, turnips, sugar canes, and strawberries. It is, perhaps, as a wheat pest that rust does most damage; as the air is its faithful carrier and the fungus eats into the very heart of the plant it feeds on, the task of ousting it has so far proved baffling. It is otherwise with smut, which, especially in its fetid variety, has been in the past one of the principal scourges of the wheat field. To Dr. J. L. Jensen, a Danish experimenter, is due a simple preventive for fetid smut; it is soaking the seed in water heated to 133° Fahrenheit for 8 minutes. This kills the smut spore and leaves the grain none the worse, but rather better, for its warm bath. Potato scab, a serious nuisance, has been traced by Mr. H. L. Bolley of the Fargo station, N. D., as due to bacteria, which can be destroyed by immersing potato sections for 90 minutes before planting in a solution of 2 ounces of corrosive sublimate in 15 gallons of water. Experience shows that the disease affects the soil which has borne a crop of tainted tubers, and how to combat that evil Mr. Bolley is now inquiring. The chinch bug, one of the most persistent pests of wheat, corn, and grasses, has been abated materially since the introduction of the fungus disease due to *micrococcus insectorum*. The leaders in this particular fight have been Prof. Snow of the Kansas station at Lawrence, and Prof. Forbes of the Illinois station at Champaign.

PARASITES CAN BE HELPFUL.

One of the most striking exhibits made by the men of experiment in agriculture is a small row of phials in which are the roots of peas, beans, clover, and other plants, showing the little warts or nodules which are the dwelling places of certain bacteria. These bacteria are known to be a very profitable tenantry, for while they consume a little of the root wherein they lodge, they pay a handsome rent in the vital compounds of nitrogen which they build up out of the air and pass on to the plant—compounds which the plant could not easily get in any other way. Nitrogen thus obtained is a free gift of nature, for it forms four-fifths of the volume of the air; nitrogen as an element in artificial fertilizers is a costly purchase. That peas and other plants could derive nitrogen from the atmosphere has long been clear to Prof. W. O. Atwater of Middletown, Conn., and other investigators. It was reserved for Prof. Hellriegel of the experiment station at Bernburg, Germany, to discover the process, to trace the singular and altogether helpful partnership which can subsist between a plant and the bacteria at its roots. Prof. Atwater says that scarlet clover, alfalfa, serradella, peas, cow peas, beans, and lupine, all acquire large quantities of nitrogen from the air during growth through a parasitic commissariat. The inclusion of the cow pea in this list is of special importance to the Southern farmer; in Northern and Eastern States the scarlet clover, under conditions that insure its thorough "inoculation," is being widely introduced. The contrast between peas inoculated and not inoculated is plainly brought out in much enlarged photographs of root systems sent to the exhibit by Messrs. Lawes & Gilbert from their famous farm at Rothamsted, in England. These pictures explain what so long puzzled observers, the fact that a crop of peas or beans will leave the soil richer in important elements of fertility than it found it. Prof. Hellriegel's discovery points the farmer to the need of his getting through loam-water or other agency an abundant supply of nitrogen-catching bacteria for his beans, peas, and clover. The heavy crops due to these microscopic purveyors, now bred and sown of set purpose, give a conclusive answer to the question: What connection can there be between scientific research and practical farming?

HOW THE EXPERIMENT STATIONS ARE MAINTAINED.

By the Hatch act of 1891 an agricultural college in each State is subsidized by the Federal Treasury to the extent of $15,000 for its first year and receives $1,000 more every year until its subsidy reaches $25,000, when the annual aid is no longer increased. In the frequent case where an experiment station is connected with an agricultural college this national assistance inures to the experiment station. Where the station is an independent concern the annual contribution from Washington is $15,000. Altogether the best results are gained at stations attached to colleges, the acknowledged primacy being held by the station at the agricultural college of Cornell University, Ithaca, N. Y. At this college the full course of instruction extends through four years, with pretty stiff requirements for admission; a shorter course, for two years, is also given, and there are classes for such students as can attend college only in winter. It is expected that next year a summer course will be added, which will place Cornell far in the lead in the education of farmers. Within the past ten years it is safe to say that scientific observation and experiment and improved labor-saving machinery have quietly revolutionized farming, gardening, dairying, and stock raising. It is gratifying to know that in facilities to avail themselves of every advance in practice and theory of these great industries the youth of the Empire State are the most highly favored in the Union.

GEORGE ILES.

GOOD STORIES OF THE PRESENT DAY.

The Strange Disappearance and Recovery of Jacob Beeson's Will.

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At 2 o'clock on the afternoon of the 21st day of January, 187-, old Jacob Beeson entered the law office of Henry Platt, in the town of Little Falls, and said to the lawyer:

"See here, Henry, we'd better fix up that will this afternoon. You git all ready, and I'll be back in half an hour."

Jacob Beeson was a farmer and worth about $70,000, while I was studying law with Mr. Platt. Twice during the last six months he had dropped in to talk about a will, and his visits were of peculiar interest to me. The old man was a widower, and Mary Thompson, his niece, had lived with him for several years and was likely to be handsomely remembered in the will. I was 20 years old and Mary was a year younger, and we were engaged, though the old man knew nothing about it. One of his sisters was his housekeeper, and his only child had grown to manhood and left home long ago. Bill Beeson, as this son was familiarly called, had made the father no end of trouble and was even then serving out a sentence in State prison. A draft of a will was ready against the old man's return, and as he removed his overcoat, comforter, and yarn mittens he said:

"Bill has been a dreffui bad boy, as you know, Henry, but I can't forgit that he is of my own flesh and blood. Nobody would blame me if I cut him off with a shillin', but I've made up my mind to leave him 'nuff to start on when he comes outer prison. I want it fixed about this way: Say $30,000 to my niece Mary; $20,000 to my sister Polly; $10,000 to Bill; $5,000 to build a Baptist meeting house, and the rest, if thar should be any, to fixin' up the town graveyard and buildin' a free bridge across Cedar Creek. I calkerlate I'm wuth between $70,000 and $75,000, but we can't tell how much of a shrinkage thar may be."

The will was drawn as he dictated, and I went out and got witnesses to sign it. Mr. Platt had been the old man's lawyer for years and had kept all his papers in the office safe. This will, when duly signed, was placed in the strong box by my own hands, and I felt like shouting when I realized how generously May had been remembered. When all was over the old man, the lawyer, and the witnesses went out to have a drink together, while I remained to care for the office. They had not been gone two minutes when I got a call from a tramp. He had an unusually pathetic story to tell, and as I had no change I stepped out to get a bill broken. He was not left alone over three or four minutes, and I knew that the money drawer of the safe was locked. He went away blessing me, and the incident soon passed out of mind.

On the 18th day of March, almost two months later, Jacob Beeson was killed by his team running away as he was driving into town. Within an hour of the calamity his son, Bill, arrived home, having served his time. The funeral was to be held on the 21st, and the will was to be read after the ceremonies. Mr. Platt asked me to go out with him, and it was noon of the 21st before he went to the safe for the will. We had half a dozen wills in a certain pigeon hole, and Jacob Beeson's had been placed on top of the pile. We were not at all upset when we failed to find it there, but fifteen minutes later, when every piece of paper had been overhauled and the will was still missing, we were in despair. Burglars had never touched the safe, nor was any other paper missing. The lawyer remembered seeing me deposit the will, and when I ran out and brought in the witnesses they also remembered the fact. Mr. Beeson had not been in the office since, and there had been no occasion to look at the will. We hunted high and low, but it could not be found. We couldn't believe that it had been abstracted from the safe, for no opportunity had offered, and no one outside of the four of us knew that a will had been made. Beeson had not said a word to his sister or niece, and Mr. Platt, who knew of my love affair with the latter, had cautioned me to drop no hint. We concluded that the paper had somehow been mislaid, and this was the explanation made after the funeral.

Bill Beeson had come home to tell his father that he had reformed and was resolved to be a better man. The father might have believed in him, but no one else would. He was regarded by the public as a thorough-paced scoundrel, and no one was deceived by his hypocritical demeanor at the funeral. He was no doubt secretly glad at the death of his father. He was probably hoping that no will had been made, for a look of surprise and disappointment was noticed when the announcement was made. Later on he wanted to know how the property had been left, but, of course, we gave him no satisfaction. We returned straight to the office and began a search which lasted the night through. Everything was investigated and inspected, but when daylight came the will had not been found. We were certain then that it had been abstracted from the safe. But by whom, and at what time? Bill Beeson was in prison at the time, and could not have known of the making of the will.

We sat down to recall the past day by day, and neither of us could remember of any stranger visiting the office since the will was made. Three men were positive of seeing me take the paper from the lawyer's hands and step over to the safe with it. I was positive that I placed it on top of the other wills in a pigeonhole. It had disappeared. Figure and theorize as we might, and as we did, we could come to no satisfactory conclusion. I was sent to the prison where Bill Beeson was serving his sentence, but no letter from his father had been received for a year previous to his discharge. Therefore he could not have known of the will. Had he suspected its existence and conspired with some convict about to be discharged to steal it? Only three men left the prison during the two months, and none of those had come in contact with Beeson.

Bill Beeson waited a month for us to find that will, and he then naturally concluded that it could not be found. Then he ordered his aunt and cousin off the place, and took the necessary legal steps to be placed in possession. There was no getting around the fact that he was the legal heir, and after a time the law declared him such. He was told of the provisions of the will, of course, but he refused to make any sort of division, and settled down to the enjoyment of the entire estate. The lawyer realized that his reputation had suffered, and, aside from feeling cut up that Mary had been done out of her fortune, I felt in a sense responsible for the disappearance of that valuable document. I spent hours and hours in trying to figure out the mystery, and one night as I sat thinking over it I got the first glimpse of light. For the first time I remembered the visit of the tramp. He had been left alone in the office for three or four minutes.

The idea that he would go to the safe and select that one paper from all others was far fetched, but in spite of Mr. Platt's arguments to the contrary I felt certain that he did it. He would go to the safe in search of money. Not finding any, he might snatch at a paper, hoping it would be valuable enough to bring a reward. Standing by itself the theory was all right, but when I asked myself why, if it was the will, he hadn't communicated with us, I could make no answer. If he got it, he would be just as likely to negotiate with Bill Beeson as with us, even more so. I began an inquiry, however, and soon discovered several people who remembered my caller. He had been hanging around town for a couple of days before I saw him, and after a bit I settled the fact that he left the day after. No one knew which way he went, and my investigation had to cease there.

July had come, and Bill Beeson was in full swing, and we had given up the will as lost for ever when I happened in the Mayor's office one day. He was looking through his mail, and as he opened a cheap and badly soiled envelope containing a half sheet of note paper written over in pencil, he laughingly observed that he had a large correspondence with tramps. He glanced at the letter, uttered a "humph!" and was about to throw it away when I reached for it and remarked that I would take the trouble to answer it in his name. It had been written with a hard pencil, and the chirography was scrawly and the spelling a regular puzzle. I took it to the office and went over it word by word, and when I had finished I startled Mr. Platt by uttering a cheer. The Mayor's name was William Benson. The letter was directed to William Beeson. The superscription was so poor, however, that no blame could be attached to the distributing clerk. When translated into decent English, it read: "Was Jacob Beeson your father? Did he make a will? Is the will worth anything to you? How much?" The writer was in the St. Claire county jail and anxious for a trade.

Now we had a clue for sure, and that night I started for the county seat of the county mentioned, which was 100 miles away. The date of the letter was ten days' old, and it had probably been given to some prisoner to post when discharged. I made sure of getting possession of the will, but was doomed to disappointment. The letter had been signed "J. White." A prisoner of that name, and no doubt the writer of the epistle, had died the day before of consumption, and the body was in the coffin and ready for burial when I arrived. I could not identify it as the face of my tramp, but believing that it was he I exhibited the letter and asked for a search of his effects. He had been sent up about the middle of May on a three months' sentence, and had arrived at the jail without a coat. The search was brief and fruitless. It was about a month after this episode when I set out on what the lawyer called a wild goose chase. It was a conversation with Mary Thompson which caused me to make the trip.

"This J. White probably took the will from the safe," she said, as we talked it over. "Where he kept himself from Jan. 21 to the middle of May we do not know, but ought to find out. He probably put in the time between here and St. Claire county. You should learn the circumstances of his arrest. If he had the will, he carried it in his coat. How did it happen he had no coat when arrested? You must take a horse and buggy and drive over the highway and try to locate him."

I drove to the west for two days without hearing anything of J. White. Plenty of tramps had passed over the great highway during the winter, but if he was among them he could not be identified. On the morning of the third day I crossed the line into St. Claire county. About 9 o'clock in the morning, as I came to a crossroads, a farmer hailed me and told me to drive into his yard for safety. He was the owner of a bad-tempered bull which had escaped from the field into the highway and was menacing all travellers on the road to the west. Half a dozen men were then trying to drive the animal back into the field.

"I expect I'll have to shoot the critter or see him kill some one," observed the farmer as we sat on the fence and watched the movements of the furious animal.

"He'd keep the road clear of tramps if allowed his liberty," I replied.

"Sartin he would. Ha! ha! ha! I was thinkin of suthin that happened last spring. A mile to the north over them fields thar's a cross road. Heaps o' tramps cut across right here, and you'll find a reg'lar path along the aige of that clover field. I was in the orchard over thar, and the bull was in the clover lot and racing around, when I suddenly heard a great yelling. A tramp was makin the short cut, and the bull was after him. That chap was a surprise. He looked seedy and broke up, but the way he did let himself out was a caution. Fur about forty rods he went like greased lightnin. D'ye see that lone cherry tree thar?"

"I do."

"See a scarecrow on a lower branch?"

"Yes, I see an old coat swinging there."

"Waal, the feller made fur that tree as he run, but the bull was so clus after him that he didn't stop to climb. He peeled off his coat and flung it down, and that's what saved him. The bull stopped to toss it, and the tramp reached the road. Jim Wheedon, our constable, happened along, and him and the tramp had some words, and Jim run him in."

"Do you know if the tramp was sent up?"

"I never thought to ask."

"But the coat was never called for?"

"No. It lay on the ground till two weeks ago, and then I hung it up for a scarecrow."

"Did you examine it?"

"No, sir-e-e! I ain't handling coats tramps have lived in for two or three years."

I told him I'd like to go down and have a look at it, and he laughingly replied that he had no objections. It was old and ragged and ready to fall to pieces, and I found nothing whatever in the pockets. I had got it on a stick ready to hang up again, when I decided on a more thorough investigation. Stitched between the lining and the cloth in the back of his coat I found Jacob Beeson's will, much the worse for long exposure, but still in fair condition. If my surprise was great, that of the farmer when he came to hear the whole story was far greater. All he could say was:

"Waal, by gosh! Just think of a scarecrow worth $80,000!"

Bill Beeson had to step down and out, and the property was divided as intended. Mary Thompson got her $30,000, I got Mary, and according to the best of my knowledge and belief everything turned out for the best, and everybody ought to have been happy.

Drifting Away.

At midnight on the night of the 28th of August, 1859, the order was passed along the decks of the ship to stand ready to heave her to. We were midway between the island of St. Paul and the Cape of Good Hope, racing for the cape. For eight hours we had been driving on like a wild locomotive, followed by the mighty waves of the great Indian Ocean, but the ship could no longer outrun them, though driven by the power of a hurricane. She must be brought head to the sea to save her. During the next ten minutes the chances against her were as twenty to one, and at the critical moment her decks were so deluged that the great fabric seemed to be settling down under our feet. Men cried out, and then shut their eyes and ceased to breathe. It seemed an age before she swung around to meet the waves head on, and the wheel was lashed to keep her on the port tack, but when that had been done human hands could do no more.

Running off before the gale we had not felt its full force, but now it was enough to appal the stoutest heart. The roar of Niagara would have been drowned a hundred times over. There was such a shrieking and screaming from up aloft that one became cowardly in spite of himself, and the motion of the ship obliged every man to lash himself where he stood. It was the brightest of moons and the clarest of skies, and yet that hurricane came out of the west as if driven by all the steam power of a continent. Now the ship almost stood on her rudder as she went climbing up the slope of a wave which seemed to roll higher than our mastheads; now she went racing down on the other side with railroad speed, and it seemed as if the abyss was a thousand feet deep and that she must find bottom. From 12:30 to daylight it seemed simply a question of how quick the end would come.

As the sun came up the wind dropped a little, but the spectacle was one on which many of the men refused to look. The great ocean was a bed of froth, and rising out of the froth were regular walls of green water crested with foam, which reared themselves to a height of forty or fifty feet and raced into the eastern horizon at a speed of a mile a minute. Sunrise found us lashed where we were at midnight, and noon had come before any man dared move about. The gale had broken and the spoondrift was no longer flung over us like fresh snow, but it would be hours before we could get the ship on her course. The men were nibbling at the only food to be got at when the lookout gave an alarm. On our starboard bow, drifting at the same rate as we were, and now hidden by froth and now heaved clearly into view, was a man lashed to a hatch cover. He was not above fifty feet away, and as we gathered at the rail he waved his hand to us. Somewhere to the west of us his ship had foundered during the night.

As we had the wind and sea in our favor, we tried to float him out a buoy. It would almost reach him and then whirl away astern, as if carried by some current created by the hull of the ship. If he shouted, we could not hear him, but each time we pulled the buoy back to make a fresh trial he encouraged us with a gesture. We made a dozen attempts before we gave it up, and then we got out the signal gun and tried to fire a line over him. With an ordinary sea running his chances would have been good. If too rough for a boat, we could have got the buoy to him or sent him a line by the gun. With the gale still piping and the waves running so tremendously high we could do nothing as it ought to be done. Twice the line fell fairly over his float. Once it was just as the foam smothered him, and he could neither see nor act, and again he got hold of it with his right hand, but could not stand the strain of pulling in and had to let go. It was a horrible thing to stand and watch that man and imagine his feelings. A hundred feet from him was certain salvation, but he could not reach us, and we could not reach him.

After he let go of the line he seemed to realize that it was a useless fight, and he waved his hand to us as if to say that we need make no further efforts, but we tried both buoy and cannon again. The sea was determined to have his life, and after two hours' work the mate signalled to him that we could do no more until the sea went down. Just then some mysterious action of wind and wave began to increase his distance from us. He noticed it as soon as we did, and making a gesture which meant "Good-by," he turned his face away from us and was soon out of sight, drifting away into an expanse whose nearest shore was the coast of Africa.

"Poor man!" sighed the mate when he could no longer make out anything.

"Poor man!" sighed every one else aboard when it was known that he had disappeared, and that another sunrise would witness a corpse lashed to the wreckage and tumbling about on the angry ocean.

WHAT MIGHT SEEM A RIOT

Often is Only Russian or Polish Jews Discussing the Rabbi's Last Sermon.

"The Russian and Polish Jews are often accused by the police, through ignorance of their character and language, of getting into rows," said an intelligent east side rabbi. "It is the nature of this sort of Jew to be demonstrative and noisy. These attributes have been recognized to some extent by the caricaturists, who have exploited them in humorous sketches and illustrations, but they can only be fully understood by the student who appreciates the characters of these people. I have frequently seen groups of them at meetings, social gatherings, in the synagogues, and on the streets, who would be supposed to be quarrelling angrily, when, as a matter of fact they were most peaceably disposed. Physical and mental nervousness are largely responsible for the violence of their actions and the loudness of their conversation. Life in the ghettos has affected their nervous systems particularly, and the slightest excitement arouses them.

Both the Russians and Poles are fond of religious discussions, and it is not unusual to see them splitting fine hairs in dispute as to the meaning of some Talmudical sentence. They love an argument, and a difference between two of them on the street as to the difference to be drawn from the chief rabbi's latest sermon is sure to attract a crowd. The latter will surely take sides, and the result will be a pushing, wrangling, excited mob, which the police may think is rioting. Such a scene is exactly like those that were of daily occurrence in ancient Jerusalem, and even in Alexandria, after the Jews were brought there by Ptolemy, one of Alexander's Generals.

THE OLD SETTLER.

He Is Delighted to Hear That the Story of the Little Hatchet Is Not True.

"Gran'pop," said little Peleg one day, "Didn't you ever hear of George Washington and his little hatchet?"

"Peleg!" replied the Old Settler, looking sternly at his inquiring grandson. "'Arly an' late, an' late an' 'arly I've sot ye a warnin' ag'in siniwatin'. Do you think that 'cause Sugar Swamp wa'n't swellin' an' bustin' with population like the Ridge is here that folks never heerd nuthin' there? Do you think that 'cause the schoolma'ms that usety ketch the young ideas o' Sugar Swamp by the seat o' the pants an' the nap o' the neck an' churn 'em till tha were blisters on 'em—do ye think that 'cause them schoolma'ms didn't chaw gum an' wear their hair down in their eyes that the young idea o' Sugar Swamp didn't know nuthin'? You're 'siniwatin', Peleg! You're 'siniwatin' that your poor old gran'pap didn't git no furder along in his eddication than to stan' up ag'in the wall an' spell b-a ba; k-e-r, ker—baker, an' hol' up his han' to ast wuther him an' Bill Bonutt couldn't please go out an' git a pail o' water. But I kin tell ye, sonny, that the young idee o' the Sugar Swamp deestric' grabbed l'arnin' in great big chunks, an' the schoolmarm never had to ast me more'n wunst how much tootemstoo was. I hadn't orter say nuthin' more to ye, 'cause ye 'siniwated, but just to pour coals o' fire on your head I'll let ye know, b'gosh, that I have heerd o' George Wash'n'ton an' his little hatchet, an' the onfortnit cherry tree, an' more'n all that, I don't think a durn sight o' the hull business, nuther!"

"Don't you, gran'pop?" exclaimed Peleg. "Well, do you know that it has been found out that it ain't so?"

"What hain't so?" asked the Old Settler.

"Why," replied Peleg, "what history says about Washington and the hatchet. He didn't cut the cherry tree down with his hatchet."

"Go 'way!" ejaculated the Old Settler. "What did he cut it down with?"

"Nothing," said Peleg. "He didn't cut the cherry tree down at all."

"An' George didn't go up to his pop an' say, 'Father, I can't tell a lie! I done it with my little hatchet?'"

"That's what the teacher says has been discovered," said Peleg.

"Sonny," said the Old Settler, "this here has added sumpin' like nineteen or twenty years to your gran'pap's life. It has took a load offen his mind like liftin' a fifty-pound weight offen a pressin' o' head cheese! That's the only thing I had ag'in Wash'n'ton. Jist to think of a man ez liked his little hooter o' the ol' stuff in the mornin's, like he did, with tanzy in, mebby; an' a man ez could handle a cuss word now an' then without spilein' it, ez the record said he did when his men wa'n't fightin' jist to suit him, an' then to hev him handed down to hist'ry ez sayin' that he were a chap ez couldn't tell a lie! 'Why,' I usety say, 'if that's so, George Wash'n'ton mowt jist ez well a not keered fer his mornin' snifter, and he mowt jist ez well a let his sojers act foolish without chuckin' a swear or so at 'em, fer this here little statement that he can't tell a lie spiles the hull business. Some things about ye, George,' I usety say, 'is great, but I can't go that little statement 'bout lyin'! It's ag'n natur'.' An' so tha never were no hatchet an' no cherry tree, hey, Peleg? An' George Wash'n'ton never said he couldn't tell a lie! I allus said he were the greatest man I ever heerd on, an' now I know it! He liked his snifter, an' he could handle cussin' when he were mad, an' he never said he couldn't tell a lie—which has allus been a siniwation, Peleg, that anybody ez could tell a lie were pooty fur along on the down-hill side o' the turnpike! I kin hardly wait fer nex' Wash'n'ton's Birthday to come around, I want to celebrate it so bad! Peleg, allus keep yer eye on the man that makes a p'nt o' gettin' a reputation fer bein' a man ez can't tell a lie! Folks done their best to git me up a reputation like that un, but I fit it an' fit it, an' tol' 'em they musn't.

"'Don't do it!' I says. 'Tain't right! Jist 'cause I don't lie,' I says, 'hain't no sayin' that I can't,' I says.

"Even up to this very time folks often meets me an', shakin' their heads, says, 'You an' George is like two peas! What a team you an' him would a made!' they says. That has allus made me madder'n a hornet, sonny, but now when they say that to me I kin clap 'em on the back an' say:

"'Right you are, b'gosh! Me an' George 'd make that team now, matched to a T, and sound in hoof an' wizzen!'

"Which gives me a chance to recomember sumpin' fer ye, sonny. It's about a feller citizen I had wunst, who lived in the Sugar Swamp deestric'. His name was Tugg—Coriander Tugg. Now somehow or other he got the name o' bein' a man ez couldn't tell the truth' but it wa'n't so at all. Tha never were a truthfuller man ever lived in Sugar Swamp—an' I don't 'cept myself, nuther—than Coriander Tugg were. But folks wouldn't b'lieve anything he said, an' things got so bimeby that Coriander begun to git worked up over it, an' said that if folks didn't look out he'd show 'em one o' these days wuther he didn't tell the truth or not. I usety argy with folks an' tell 'em they was wrong, 'cause I know'd Coriander wa'n't the all-pervadin' liar they said he were, an' they actu'ly got to sayin' that the fust thing they know'd they'd be a 'spectin' me o' stretchin' things! The folks that had fust set ev'rybody ag'in Coriander was Jepthy Hibbly an' his ol' aunt 'Mandy. They was in the storekeepin' business an' so were Coriander, an' Jepthy had grow'd up with the reputation o' bein' a man ez couldn't tell a lie. He said he was setch, an' folks somehow had got in the habit o' b'lievin' him, an' so when Coriander Tugg started in the storekeepin' business in Sugar Swamp Jepthy give it out that Coriander couldn't tell the truth, an' folks had to b'lieve what Jepthy said. So things went kind o' tough with Coriander, an' one day he come to me an' says:

"'Sile,' says he, 'I'm gointer turn this here deestric' topsy-turvy!' says he.

"'Coriander,' says I, 'how?'

"'Sile,' says he, 'I kin out-bewitch the witchin'est witch ez ever lived when it comes to bewitchin' things,' says he.

"'Coriander,' says I, 'I never know'd ye could,' says I, 'but if you say so I know tha hain't no doubt ye kin.'

"'Sile,' says he, 'ye kin bate yer boots fer ten ginerations that I kin,' says he. 'An' w'at do ye s'pose I'm gointer do?' says he.

"'Coriander,' says I, 'I dunno.'

"'Sile,' says he, 'you know, and so do I, that Jepthy Hibbly is the biggest liar on the face o' the earth, an' so is his aunt 'Mandy,' says he.

"'Coriander,' says I, 'if tha's anything I do know it's that!' says I.

"'Sile,' says Coriander, 'I'm gointer bewitch Jepthy's store things so's he'll show all his customers what a durn lyin' feller citizen he is, an' yit he'll be a-tellin' 'em the truth all the time!' says he. 'Ye couldn't do much wuss to a chap than that, could ye?' says he.

"'Coriander,' says I, 'b'gosh ye couldn't!'

"So Coriander he tells me to go over to Jepthy's store nex' day an' hang around. I did, an' ev'rything looked jist ez it alluz did, till in come ol' Sister Duntubbs, a p'tic'lar friend o' Jepthy's an' Aunt Mandy's. She ordered a pound o' pork an' a yard o' caliker. Jepthy weighed out the pork, an' ez he done it up I see that Sister Duntubbs looked kind o' stary at Jepthy. Then he mea-ured off the caliker, and Sister Duntubbs says:

"'Brother Hibbly,' says she, 'I said a pound o' pork an' a yard o' caliker.'

"'Yes, Sister Duntubbs,' says Jepthy, 'that's w'at I heerd ye.'

"'But ye only give me half a pound o' pork an' half a yard o' caliker,' says she.

"'Oh, no!' says Jepthy.

"'Oh, yes!' says Sister Duntubbs.

"Then Jepthy weighed the pork over ag'in. It weighed a pound. He measured the caliker. It measured a yard.

"'There!' says he, 'That's right, sister! A pound o' pork an' a yard o' caliker!'

"'It's no setch thing!' says Sister Duntubbs, mad. 'It's only half a pound an' half a yard!'

"And then Aunt 'Mandy come an' jined the chorus, an' pooty soon there were the liveliest kind of a quarrel goin' on, an' Sister Duntubbs hustled out o' the store, yellin' that she'd never come in setch a cheaty place ag'in. Coriander's witchin' were workin' fine. The pork were a pound an' the caliker were a yard, but the store were bewitched to Sister Duntubbs, and she could only see half a pound and half a yard. An' so it kep' on goin'. Folks came in an ordered things, and Jepthy weighed an' counted an' measured 'em, but they never came out right, an' ev'rybody bimeby got it inter their heads that Jepthy were an ol' cheat an' a liar arter all. So they quit his store, an' had to do the nex' thing, which were trade at Coriander's store, an' when they found that he could tell the truth about ez well ez anybody, they kep' on tradin' there. Sure enough, Coriander had turned the deestric' topsy-turvy!

"Well, sir, the consekence were that Jepthy an' Aunt 'Mandy had to pull up an' leave the deestric', an' they'm recomembered there now ez the most onblushin' liars ez ever lived, an' it were tellin' the snuggest kind o' gospel truth—sumpin' they hadn't done afore—that give 'em the reputation. An' so, Peleg, I were allus glad I fit ag'in folks buildin' me up a reputation fer bein' one ez couldn't tell a lie, though they know tol'able well that I fight shy o' doin' of it. An' I'm glad that thar hain't nothin' in that story 'bout the little hatchet an' the cherry tree, 'cause now I kin look folks in the face when they say to me that mean' George Wash'n'ton 'd made a match team, an' kin slap 'em on the back an' say:

"'Right you are, b'gosh! Me an' George 'd make that team, now, b'gosh! mighty, matched to a T, an' sound in hoof an' wizzen!'"

ED MOTT.

NOTES ON SCIENCE AND INDUSTRY.

A French journal, remarking that condensing engines would often be used in places now considered undesirable on account of the difficulty in obtaining a sufficient supply of water, describes an ingenious resort for meeting that difficulty. The apparatus in this case was designed for use with a seventy horse-power engine. A tank was first made 6¾ feet long, 3⅛ feet wide, and 2⅝ feet deep, divided by a series of vertical wooden partitions four inches apart. The warm water and steam from the engine are delivered on the top edges of these partitions, trickling down from them, while at the same time a strong current of air is driven upward between the partitions by means of a fan about four feet in diameter; this air acts in two ways—by absorbing heat itself and by evaporating a portion of the water, the remainder being cooled by the action of each process. It is stated that in winter the former action is more effective and in summer the latter, the net result being practically constant throughout the air. The air, under this arrangement, is found to have a velocity of twenty-one feet a second, and the steam that is condensed is found to make up for the vapor carried off.

A recent English improvement in machinery for preparing and spinning cotton renders it practicable to balance the lifting rail and to adjust automatically the balance according to the weight of fibre wound upon the bobbins. For this purpose a weight arranged to slide upon a lever is employed, connected by chains or links to the lifting slides of the machine; this weight is traversed along the lever by a screw, which in its turn, is operated upon by the cone drum strap shifting motion or other constant motion of the machine. The pitch of the screw and the size of the sliding weight can be regulated so as exactly to compensate for the weight of fibre wound upon the bobbins; in this way an exact balance of the lifting rail all through the building of the set of bobbins is obtained. When the building of the set of bobbins is completed and it is necessary to doff, the cone drum strap fork is moved by the frame tenter to recommence a new set of bobbins, and the weight is also by the same motion moved back to its normal position, ready to be traversed along the lever as the winding of the bobbins proceeds.

One of the most convenient devices lately introduced is a machine for measuring cloth; whether cotton or woollen; an apparatus which not only takes the length of a piece of cloth, but also records it, yard by yard, on the margin, one of the chief advantages of the mechanism being that the operation of measuring never requires to be repeated. That is, the retailer finds the piece he buys marked on the wrong side of the selvage through its entire length, and he has only to unfold the last yard to see if the length corresponds with the invoice, and at any subsequent time it can be seen at a glance how much there is left. Thus, the whole trouble involved in remeasuring is done away with, and also the liability of making mistakes in cutting lengths to supply customers' needs. The cloth is not damaged in any manner. Many classes of goods, such as silks, are woven with a selvage that has to be cut off before they are made up, while for others an ink is used for marking the figures that can be removed as easily and completely as the tailor's chalk from a coat. This useful machine can be driven either by hand or power.

A high-pressure fire engine of somewhat notable type has been manufactured in London for a South American fire department and specially designated to work at the exceptional water pressure of 300 pounds per square inch. The apparatus is fitted with two steam cylinders and two direct and double acting pumps arranged vertically in front of the boiler. The collective area of the valves is large, so that the barrels are filled at each stroke. The suction and delivery valves are contained in two chambers, the suction valves at back and the delivery valves in front of pump, so arranged as to be easy of access by the removal of either cover. The crosshead works in guides in front of the pump, and, owing to its special form, it admits of the use of long connecting rods, thus insuring easy running. The boiler is constructed of Lowmoor iron, and is fitted with an annular water casing surrounding the fire box; the tubes are solid drawn, of two forms, viz., curved tubes arranged at opposite sides of the fire box, and inclined tubes arranged across the fire box, all opening at both ends to the water space. Good circulation is thus obtained, and the steam is freely disengaged over a large area of the water space, reducing the tendency to prime. Steam can be raised from cold water in three minutes, and to working pressure in six to eight minutes from time of lighting the fire.

The extensive use of the material now known as gloria is mentioned as characterizing the manufacture of umbrellas and dress pieces as well. The fabric is described as a product of silk and wool of fine quality, its high degree of lustre being due to the silk which it contains. It is usually dyed in the piece, the operator in carrying out this process being obliged to make a nice study of obtaining exactly the same shade of the two fibres, owing to the difference of affinity they possess for different dyestuffs; and although, even when working under the most favorable conditions, it is scarcely possible to secure the same shade, the difference, as a rule, may be slight. Much is said to depend on the construction of the gloria—that is, sometimes the divergence may produce a shot effect in the fabric which may be wanted; in others again the difference is not perceptible in the dyed pieces, which have a solid appearance. The acid colors in general are found to give the best results in dyeing this fabric, a bath of 10 per cent. of Glauber's salts and two per cent. of sulphuric acid in addition to the dyestuff.

Experts in determining the character of different lubricating oils have arrived at the conclusion that the best oil is that which has the greatest adhesion to metallic surfaces and the least cohesion in its own particles, fine mineral oils standing first in this respect, sperm oil second, neatsfoot oil third, and lard oil fourth, consequently the finest mineral oils are best for light bearings and high velocities; the best animal oil for giving body to fine mineral oils is sperm oil, but lard and neatsfoot oil may replace the sperm when greater tenacity is required. For cylinders the best mineral oil is one having a density of .893 and a flashing point of 680° F. for heavy machinery the best mineral oil has a density of .880 and a flashing point of 520° F.; for light bearings and high velocity, the best mineral oil has a density of .871 and a flashing point of 500° F. For very heavy machinery mineral oils are not suitable on account of their want of body, but well purified animal oils are applicable to the heaviest machinery. Among vegetable oils, olive oil stands first, as it can be purified without the aid of mineral acids; the other vegetable oils which, though far inferior to olive oil, are admissible as lubricants, are, in the order of their merit, sesame, earth-nut, rape and colza, and cottonseed oils—no oil being admissible which has been purified by means of mineral acids.

Further investigations made by M. Behrens concerning the microscopic structure of alloys show that crystallization is a common phenomenon pertaining to metals; that the least crystalline are pure Al, Cu, Ni, when cast without overheating; that rapid cooling has no other effect than to make the crystals of smaller size, but pure Ag does not always show crystallization if properly etched, and that in alloys crystallization is more easy and perfect than in unalloyed metals. When one gr. of Cu, alloyed with two mgrs. of Ag, is melted and slowly cooled, it will be found checkered by minute threads of an alloy rich in silver. All types of structure found in crystalline rocks can be reproduced in alloys—the most common is rectangular wicker work, the less common being isolated clusters of crystals, or alloys with few crystals of high melting point. Mechanical stress does not destroy the crystalline structure. A fibrous or lamellar structure is set up, corresponding with planes of sliding or shearing in inter-crystalline matter, and under heavy stresses partly due to flattening and stretching of crystals. By annealing, alloys of Cu with Ni can be made to crystallize even as soft iron, becoming even brittle.

Concerning the much discussed question as to the relative efficiency of the hammer and the hydraulic press, the opinion is expressed by the *Engineering and Mining Journal* that the work accomplished by some of the recently constructed machines of enormous capacity will do much in solving the problem—that it is not at all probable, however, that the steam hammer will be superseded, and for many classes of forgings it will always be indispensable. An account is given, in this regard, of some interesting experiments made a few years ago at the Arbel forges at Rive-de-Gier, in France, which failed of their immediate object, namely, to establish a definite ratio between the weight of a hammer and the power of a press required to do the same work, the result showing that forgings made under the hammer were of finer grain and of a more uniform texture than those made with the press. It was noted that while hammer forgings showed a better surface, the press forgings had greater density in the centre.

FUEL FOR SHIPS.

Benefits and Drawbacks in the Substitution of Petroleum for Coal.

WASHINGTON, Aug. 31.—The success of the British steamer James Brand in using petroleum for the generation of steam during a period of three days, in a recent voyage to Philadelphia, affords another illustration of the adaptability of liquid fuel for navigation. It is rather curious that two classes of vessels in which these experiments have been made, and often with success, are those in which the general use of oil as fuel would be most objectionable. One class is that of the vessels employed, like the James Brand, in carrying oil in bulk, since the great quantity of inflammable material in the cargo might naturally cause anxiety among the underwriters, and so raise the rates of insurance, or in some cases make them prohibitory. Another class is the war vessels, which in battle would run the risk of the explosion of their stores of petroleum by the fire of the enemy. Nevertheless, the great advantages of this fuel for some kinds of war vessels, particularly torpedo boats, has caused experiments to be conducted with it; and some very favorable reports have been made as to its practicability. It is shown that the liability to explosion has been greatly diminished in various ways, particularly by using residuum, which is non-inflammable up to a very high temperature, and by carefully constructing the apparatus. Besides, it is possible to carry the fuel some distance beneath the water line.

But, apart from the question of its use on war ships, the possibility of using petroleum safely on mercantile vessels carrying general cargoes seems to be more and more clearly shown, and the matter even now has been largely, though perhaps not wholly, reduced to the consideration of expense. It is true that there would also, probably, be some opposition among travellers to its employment, as an unnecessary risk, and taking this prejudice together with the extra cost, passenger steamers do not now generally resort to it. But, after all, steam is also an explosive under certain conditions, while war ships carry powder magazines which could blow them to atoms, and yet which are subjected to such safeguards that an explosion through negligence in time of peace is of the rarest occurrence.

Again, the use of petroleum for stationary boilers in manufactures is most familiar, and it is only an extension of the principle which would apply it to locomotive and marine boilers. Indeed, it has made its way even into households, thousands of oil stoves being used; and very likely this fact would be found to have gone far toward removing popular objections to employing liquid fuel on passenger steamers, should this be undertaken.

Two very famous sets of experiments are those of the locomotives on the Oroya Railroad of Peru and those of the London and Pacific Company's steamship, Ewo, running on the Pacific coast of South America. The latter had made 8½ knots, with seven tons of coal per day, but reached 9 knots on less than four tons of oil residuals. The evaporative power of oil is about as 7 to 4, but as coal occupies rather more space than the same weight of oil, the effective power is really about double in a ship's supply. Capt. Carmichael, the commander of the Ewo, used residuum, which was non-inflammable until heated to 350 degrees, and was therefore safe to carry. He also found that the oil did not volatilize perceptibly, nor lose its power in the tanks, and that it had no disagreeable smell. A great advantage was that the state of the weather made no difference in the ability to get up steam, and that the pressure on the boilers was constant; and another was that very few firemen and tenders were needed. The tubes on the Ewo only needed to be cleaned once in six months, and were not found dirty then.

On the Oroya Railroad two competitive locomotives exactly alike, except that one used oil and the other coal, were run for a period of five months over the same tracks, alternately pulling equal trains. It was found that while the consumption of coal per mile was a little over 79 pounds, that of oil was only about 38⅛ pounds. The result was the regular use of oil as fuel, and another railroad in that neighborhood adopted it. It is said that an Argentine railroad has all its engines adapted for this purpose, and, in fact, the South American steamships and railroad lines furnish abundant and valuable data on this subject.

Italy has also contributed much to the question of employing oil for marine boilers. She used a mixed fuel of coal and petroleum on the warship Messaggieros, thereby adding two knots to the speed, but with some damage to the boilers. Next, Italy experimented with the Ancona and the Castelfidardo, getting favorable results. More recently the system of engineer Cuniberti, used upon the Schichau torpedo boat No. 104 at Spezia, has shown excellent results. The fuel was refuse petroleum, and it was found that after many successive days of use the boiler and tubes required no repairing, while throughout no smoke was generated. The Russian steamers on the Caspian and the locomotive engines in the neighboring territory have for many years employed oil as fuel, and a torpedo boat in England used it with some success more than four years ago. The James Brand, to which reference has already been made, employed it for three days during a voyage across the ocean from Dartmouth. It is said that she is the largest steel tank steamship afloat. On the other hand, in some French experiments, out of ten cans of petroleum, protected by an armor plate in such a way as to resemble the protection that might be given to them on a torpedo boat, eight were exploded by concussion after a series of a dozen shots had been fired at the plate. This, however, concerns the employment of oil on war vessels rather than its use in the merchant marine.

The advantages of oil will be clear from what has been said of the various experiments. The use of refuse petroleum, which stands a fire test of from 300 to 350 degrees, makes the fuel practically safe under all ordinary conditions, with the precautions for tank storage which can be taken. Again, to evaporate a given quantity of water only about half the weight or bulk of oil is required, so that for a given voyage this great gain is made both of weight and space, or, in a war ship, her radius of action is proportionally increased. That there is some additional danger under intense heat arising from the calamity of fire or from negligence or accident, or imperfect apparatus, may be conceded, but an official report in our own navy is that as to storage there is now "no more danger with petroleum than with any other explosive." The advantages of carrying fewer firemen, with their belongings and quarters, and of giving very much easier work to those that are employed, since there are no tubes or grates to be cleaned and no ashes to be put overboard, is very obvious. The absence of smoke is grateful, and on a torpedo boat might be of much advantage in hostilities, while the rapidity and ease of fueling at sea is another point for consideration. Thus far, however, the question of cost has been one of prime importance in retarding the general use of petroleum in the commercial marine, particularly as the resort to it would make a heavy draft upon the supply, and thus further increase the cost.

THE FARMER KEPT COOL.

If He Had Not His Bull Would Have Soon Gored Him to Death.

RICHMOND, Ind., Sept. 1.—A few days ago, near Centreville, this county, William Martin, an elderly but still sturdy farmer, with his 10-year-old son, was going along a lane on his farm leading by a ring and rope a blooded bull, which had always been perfectly docile. Near the end of the lane is a hay barn, and as this little procession was passing it the bull, with a hoarse bellow, rushed at the old farmer, and catching him on his horns pinioned him against the barn.

The boy, who was behind the bull, was frightened almost out of his wits, but the old man kept cool. The angry animal, when it turned and caught the farmer, had, instead of goring him, pressed one of its horns on either side of his legs, just below the hips, and with deep reverberating bellowing, flashing eyes, waving tail, and curved spine, stood pressing his sharp horns deeper and deeper into the boards at the old man's back, while the earth beneath his feet was torn up and thrown far to the rear by its furious efforts to crush the object of its great fury. Thus matters stood for a quarter of a minute.

The farmer, although he did not expect to escape with his life, remained as cool as if he were simply milking a cow. He told his son, who was standing as if paralyzed, staring at the maddened bull, to run home and get the gun. The house was a quarter of a mile away and the boy ran some distance when the farmer remembered that there was a stout, long-tined pitchfork in the barn against which the bull was squeezing him tighter and tighter. He called the boy back, and told him to get the pitchfork. He got the fork, and came back. The farmer directed him to the left side of the bellowing, pawing bull, pointed out to him about where the animal's heart lay beneath the thick hide, and told him to place the tines against the bull's side at that spot.

These orders were all given with the greatest coolness and deliberation by the farmer, who was by this time covered with the foam that flew from the mouth of the enraged bull. When the boy placed the sharp tines of the fork against the bull's side, the father said:

"Now push with all your might and main!"

The boy threw all of his weight and force against the handle of the fork, sinking the tines their entire length into the bull's side. The animal dropped to his knees as if he had been shot, and with one tremendous bellow rolled over on his side dead. The tines had passed clear through his heart. The old farmer fell to the ground, too, for he was badly bruised, and almost exhausted. He soon recovered and hobbled home. His coolness had saved him. If he had struggled to escape the bull would have almost instantly gored and tram led him to death.